Stroke in Bogota, Colombia: Are we that Different?

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Abstract

Aim of the Study: The aim of this communiqué is to describe stroke characteristics in Bogota, Colombia, from June 2018 to June 2019.

Subjects and Methodology: The patient pool was extracted from patients with a retrospective consecutive brain infarct diagnosis admitted in a single hospital. With the provided data, continuous as well as categorical variables were analyzed. Mean, standard deviation and range values were obtained for continuous variables. Absolute numbers and descriptive percentages were calculated for categorical ones.

Results: General characteristics in stroke cases in Bogota were consistent with described cases in other major cities in the country, as well as South America. Specific differences were found in the following points: incidence of carotid disease, in-hospital fatality rate and stroke mechanism (according to TOAST classification).

Conclusion: There are few differences in stroke characteristics between the study patient pool and characteristics described in other major cities in Colombia and South America. Further research on local stroke characteristics will be a crucial factor in the development of public policies and strategies in order to handle this public health issue.

Keywords: Stroke; Colombia; Epidemiology; Brain Infarct

Introduction

Stroke is the second most common cause of death worldwide, accounting for 11.8% of global deaths (with an uncertainty interval UI (0.95) ranging between 10.9 and 13%), as well as the third most common cause of disability representing 4.5% of DALY's from all causes (UI (0.95) ranging from 4.2 and 5.2%) [1]. Stroke burden increased from 1990 to 2013, especially in developing countries, and the gap is likely to keep expanding. One of the causes for the latter could be population growth, along with a rise in non-communicable diseases, demographic transition and increased prevalence of stroke risk factors [2].

The previous facts should constitute an indicator for researchers in order to make the revision of stroke care and prevention strategies a priority. This type of care requires a custom-made strategy based on local epidemiologic analyses. Even though there is an abundance of global stroke-related data, it is necessary to broaden local information from Colombia's capital city: Bogota.

Stroke was the second most common cause of death in Colombia until 2019, coming up behind cardiovascular disease. The mean annual number of deaths by cerebrovascular disease (CVD) in the past five years was around 14.000. Previous studies calculated prevalence of CVD at 553.9 per 100.000 inhabitants, along an annual incidence of 88.9 per 100.000 [3]. Prevalence estimates tend to be higher in urban areas (9.6/1000), versus rural (4.1/1000) [4].

Around 65 to 70% of strokes in Colombia are ischemic, with a reported in-hospital fatality rate of 9.4% [5]. The mean age of admitted patients oscillates between 65 and 68 years of age, with a higher prevalence in men in the under-45 range, an equal distribution in men and women 45 to 75, and a slightly higher incidence in women above 75 [6,7]. The most frequently reported risk factors in Colombia were high blood pressure, smoking, diabetes mellitus, dyslipidemia, obesity and alcohol consumption [6-8].

Broadening available epidemiological information on clinical characteristics and outcomes of stroke patients must be a priority for local health authorities as to ensure proper resource allocations in developing regions with limited funds such as Bogota. In pursuit of this, we present the following characteristics of stroke patients admitted in a single hospital in Bogota, Colombia.

Methodology

The planned study was a single-location retrospective study in Bogota, Colombia. This city is the country's capital, with an estimated population of approximately 7.2 million in 2019 [9]. The selected location, Fundación Cardio-Infantil, is a university hospital: a 349-bed cardiologic institution. For 2019, there were 16.075 hospital discharges and 83.102 emergencies. The neurology department is composed by nine neurologists, 12 residents and four nurses, accounting for 5% (804) of all hospital discharges in 2019. The department doesn't have a neurology ward nor a stroke unit, and patients are treated in general hospital beds or mixed intensive care units (Fundación Cardioinfantil marketing office, personal communication, 2021) [10]. Data was obtained by searching for stroke diagnoses in the in-patient neurology department registry from June 2018 to June 2019. Stroke patients' demographic and clinical data, initial laboratory workups and imaging studies were obtained from the institution's records.

The study was conducted in compliance of national and international guidelines for clinical investigation, as well as with previous approval from the institutional ethics and investigation committees. Mean, standard deviation and range values were obtained for continuous variables. Absolute numbers and descriptive percentages were calculated for categorical ones.

Results

562 patients with a stroke discharged diagnosis in the studied period were registered. Transient ischemic attacks represented 21.35% (120) of total cases, intracranial hemorrhages were 6.22% (35), cerebral venous thromboses represented 0.88% (5), and brain infarcts 71.53% (402). The average age for brain infarct patients was 73.28 (± 14.52), equally distributed between men and women (50.5/49.5%). As shown in table 1, the five most frequent preexisting conditions included blood pressure, diabetes mellitus, heart failure, previous stroke and dyslipidemia. Main clinical and laboratory admission information are also included in the table.

Patient Characteristic	N 402 (Sd)	% Or Range
Demographics		
Age in years	73.28 (±14.52)	
Men/Women	203/199	50.5/49.5%
Background Medical history		
High blood pressure	285	70.89%
Diabetes mellitus	97	24.12%
Heart failure	89	22.13%
Previous stroke	84	20.85%
Dyslipidemia	75	18.65%
Atrial fibrillation	53	13.18%
Smoking	42	10.44%
Cancer (active/inactive)	25	6.21%
Admission Clinical variables		
BMI	25.47 (±4.25)	
Systolic blood pressure	145.27 (±28.16)	Range (79-233) mmHg
Diastolic blood pressure	80.07 (±15.76)	Range (35-136) mmHg
Admission laboratory variables		
Glycemia	131.84 (±70.48)	Range (3-533) mg%

Glycosylated hemoglobin	6.37 (±5.5)	Range (0.7-10.4)%
Hematocrit	43.42 (±6.84)	Range (12.9-60.6)
Hemoglobin	14.34 (±2.29)	Range (7.28-20.2) mg%
Leucocyte Count	8980 (±3720)	Range (3400-40600) mm^3
Creatinine	1.22 (±1.23)	Range (0.5-11.3) mg%
Sodium	136.72 (±3.78)	Range (123-163) meq/L
Total cholesterol	178.29 (±54.69)	Range (55-482) mg%
LDL cholesterol	109.81 (±6.13)	Range (15-355) mg%
HDL cholesterol	41.38 (±20.18)	Range (12-313) mg%
Cardiovascular workup		
24 hour cardiac monitoring/ EKG		
Atrial fibrillation	127 (in 74 new finding)	(31.59%)
Echocardiogram (TT/TE)		
Mild valve dysfunction	166	(40.88%)
Left atrial dilation	151	(37.19%)
Left ventricular concentric hypertrophy	90	(22.16%)
Left ventricular systolic dysfunction	73	(17.98%)
Carotid vascular imaging		
Internal carotid artery stenosis <50%	52	(12.8%)
Internal carotid artery stenosis >50%	15	(3.7%)
Main stroke characteristics		
Vascular territory		
Anterior	191	(47.51%)
Posterior	82	(20.39%)
Multiple	63	(15.67%)
Penetrating small vessel	24	(5.97%)
Data not available	42	(10.44%)
NIHSS admission score		
Mild (0-5)	207	(51.49%)
Moderate (6-15)	83	(20.64%)
Moderately severe (16-20)	21	(5.22%)
Severe (21-42)	27	(6.71%)
Data not available	64	(15.92%)
TOAST classification		
Undetermined	165	(41.04%)
Cardioembolic	115	(28.6%)
Small vessel disease	31	(7.71%)
Other	21	(5.17%)
Great vessel atherosclerosis	19	(4.72%)
Data not available	51	(12.68%)
In-hospital case fatality	13	(3.2%)
Intravenous thrombolysis	41	(10.2%)

Table 1: Main demographic, clinical, laboratory, imaging and stroke characteristics of brain infarct patients discharged from the neurology service, Fundacion Cardio-Infantil Bogota, Colombia. (June 2018-June 2019).

SD: Standard Deviation, BMI: Body Mass Index, LDL: Low Density Lipoprotein, HDL: High Density Lipoprotein, EKG: Electrocardiogram, TT: TransThoracic, TE: TransEsophageal, NIHSS: National Institute of Health Stroke Scale, TOAST: Trail of ORG 10172 in Acute Stroke Treatment.

127 of the patients (31.5) presented atrial fibrillation. Mild valve dysfunction and left atrial dilation were identified as the most frequent finding in echocardiograms, representing 40.88% (166) and 37.19% (151), respectively. Hemodynamic significant internal carotid artery stenosis (> 50%) was only discovered in 15 patients (3.7%). Most brain infarcts affected the anterior territory (47.51%) and were of mild severity (51.49%), following evaluation with the NIHSS score. Only 10.2% (41) of in-hospital patients were administered intravenous thrombolytics with recombinant tissue plasminogen activator (rtPA), along with four extra-institutional cases. The in-hospital case fatality rate for stroke brain infarct type patients was of 3.2%. Additionally, main stroke mechanisms were classified as undetermined (41.04%) and cardioembolic (28.6%), according to the TOAST classification. Missing data for vascular territory, NIHSS admission score and TOAST classification was found in 10.44%, 15.92% and 12.68% respectively. A complete cardiologic evaluation (echocardiogram, holter) was performed in 91.04% of cases, whilst a carotid study (duplex ultrasound and/or computed tomography angiography) was performed for 95% of cases.

Discussion

Colombia is classified as a middle-income country, which has been undergoing relevant changes in the past two decades. Massive gentrification, a demographic transition and changes in consumption and lifestyle habits have been occurring, along with a noticeable increase in the incidence of non-communicable diseases [2,3,10]. Hence, cerebrovascular disease has also become a public health priority to be addressed in Colombia, making the improvement of characterization of stroke patients a pressing issue. This national and local epidemiologic database will represent a tool for designing health policy and efficiently assigning public economic resources.

Stroke characteristics of the studied cohort showed various similarities with other Colombian and Latin American cities. Ischemic arterial strokes were the most frequent type, representing 92.88% of the total cases. Brain infarction accounted for 71.53% of all strokes. The mean age for patients was 73.28 (± 14.52) years of age, like four other population-based studies in Latin America [11]. Similar to previous results in Argentina and Brazil [12], the most prevalent preexisting risk factors were high blood pressure (70.9%), diabetes mellitus (24.1%), heart failure (22.1%), previous stroke (20.9%) and dyslipidemia (18.7%). High blood pressure is the single most important risk factor for stroke (brain infarct) in the studied cohort as well as Latin America [11,12]. Additionally, atrial fibrillation, either recently or previously diagnosed, was a major risk factor/etiology in the studied cohort. This study's 31.6% of subjects with atrial fibrillation is close to the 28% reported by Moreno., *et al.* at another university hospital in Bogota [13]. The higher value of newly discovered atrial fibrillation cases (18.41%) can be attributed to the cardiologic nature of Fundación Cardio-Infantil. Along with other studies' results in the region, most brain infarcts in this cohort were anterior circulation infarcts (47.51%) and with mild to moderate severity levels (72.1%) based on NIHSS scores [6,13]. Intravenous thrombolytic was administered to 10.2% of the stroke patients during the study period. This result is consistent with the trend presented in 2013 for our institution, 9.5% [6], another hospital in Bogota, 17.5% [7], and 3 Brazilian hospitals, 13.7% [14]. Despite not being shown in the results section, it is worth noting that the most important reason for not applying intravenous thrombolytic therapy in our stroke patients was the therapeutic window times being exceeded.

In this study's cohort, unlike other stroke populations in the region, there was a small percentage of patients (3.7%) in which a > 50% carotid stenosis was found. The finding doesn't relate to incomplete evaluation, since 95% of patients underwent non-invasive or invasive vascular studies. The percentage of patients with significant carotid stenosis may be due to the low incidence of this condition in our population, by unknown factors. The in-hospital case fatality for brain infarct (3.2%), was lower in comparison to the one described by Silva., *et al.* (9.4%) in another major Colombian city [5] and much lower than the 30-day ischemic stroke fatality rate reported in three other population based studies in Latin-America: 13% for Brazil [15], 17.8% for Chile [16], and 29% for Mexico [17]. The low in-hospital brain infarct case fatality rate is probably related to the low admission NIHSS score (51.49% with NIHSS score of 0-5), the institution's dysphagia screening protocol for all of stroke patients and our hospital's prevention and early detection of nosocomial infections policy. After a careful medical chart review, 41% of brain infarcts were classified as undetermined based on the TOAST classification. This could be explained by the patients presenting more than one type of stroke mechanism and difficulties in classification amongst neurologists. Other studies have shown a 19.71% prevalence rate for this last type of stroke mechanism, according to TOAST classification [18]. Incomplete workup was not an explanation for these results, since more than 90% of Fundación Cardio-Infantil's patients had had laboratory workups, cardiac monitoring, echocardiography and angiographic studies.

This study has strengths and limitations alike. The strengths represented in the 402-patient pool, along with its extensive and complete diagnostic workup in 90% of the population, and the thorough medical chart review. On the other hand, the limitations could be: the retrospective nature of the investigation, the single-location focus, the institution's lack of a stroke center and a stroke unit, the fact that not all attending physicians were in fact stroke neurologists and the general (not subgroup-based) presentation of statistics.

Nonetheless, these findings create a more robust knowledge about the abundant similarities in stroke patients across our region, and potentially the world. This calls for a better primary and secondary ischemic stroke prevention policy for our adult population. This policy should include constant screening for usual cardiovascular risk factors and prioritizing high blood pressure diagnosis and treatment for patients. For starters, it is crucial to detect atrial fibrillation in a timely manner in the asymptomatic elderly population in Bogota. Additionally, it is imperative to educate communities about the disease such as to increase the possibility of detection and early access to treatment options, particularly intravenous thrombolytic therapy. From a local public policy perspective, we think this is a call for hospitals in Bogota to conduct collaborative projects, strive for certification as stroke centers, and create strategies for continuous stroke education for all health-care workers.

Conclusion

There are few differences in stroke characteristics between the study patient pool and characteristics described in other major cities in Colombia and South America. Further research on local stroke characteristics will be a crucial factor in the development of public policies and strategies in order to handle this public health issue.

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